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(54) Abstract Title

I.c. engine cylinder block and component-mounting apron assembly

(57) A tray-like apron 1 is mounted, eg with a combination of adhesive and mechanical fastening, on the side wall (6,7, fig.2), of the cylinder block 2 for receiving engine accessories and components which are mounted directly on the apron 1, obviating the need to provide machined component mountings on the block itself. A cylinder block may thus be customised for different applications at lower cost by providing customised aprons. Components such as an ECU 55, oil filter bracket 56, cable clips, electrical harness items (59,fig.4) may be mounted on the apron(s). Each apron 1 may be folded from sheet metal to define a box-like beam 32 at the bottom for extra stiffness and to receive the tines of a fork lift truck. A sump guard 11 may be attached to the apron(s) 1, allowing a lighter weight sump to be used. The aprons may be painted, plated or anodized to provide special finishes or may carry corporate identification or instructions.

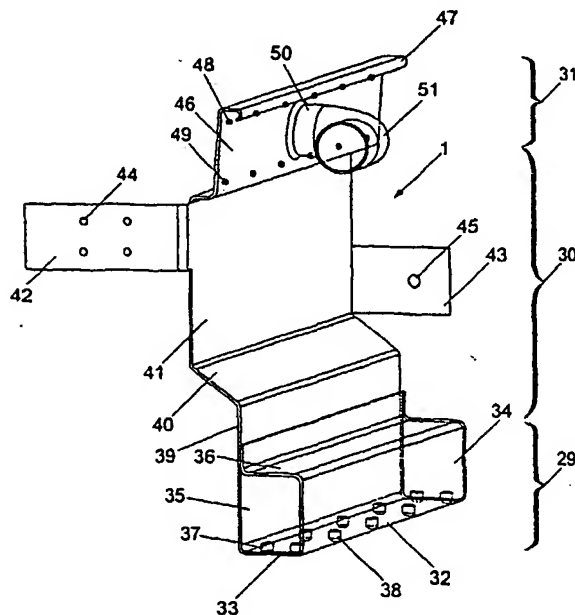


Fig. 1

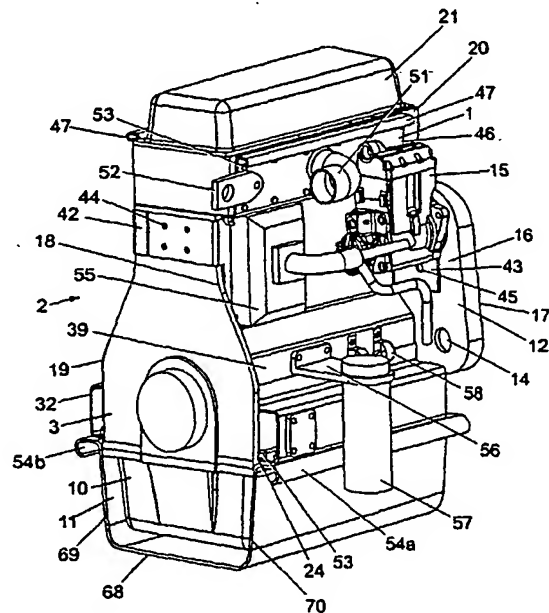


Fig. 3

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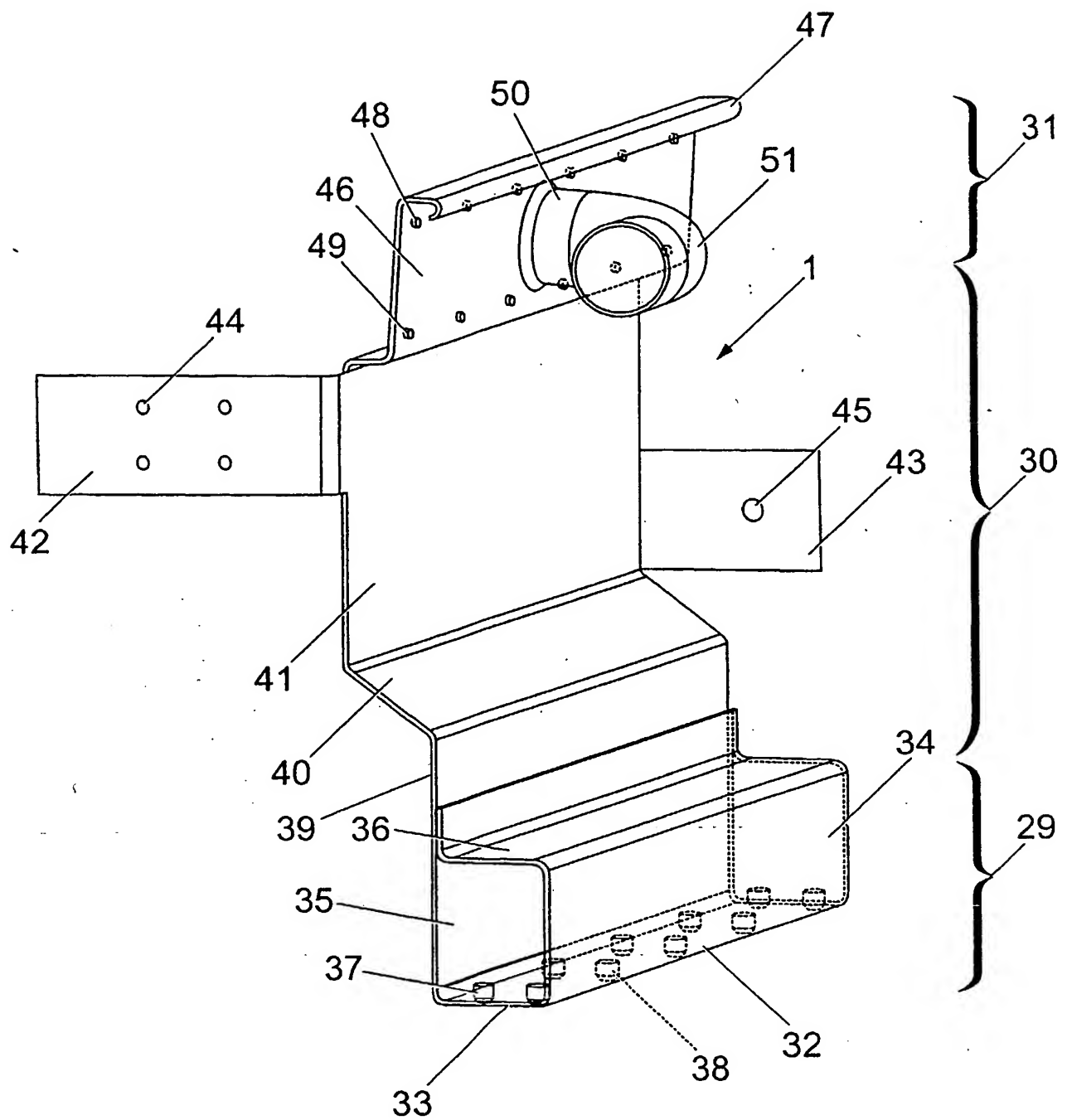


Fig. 1

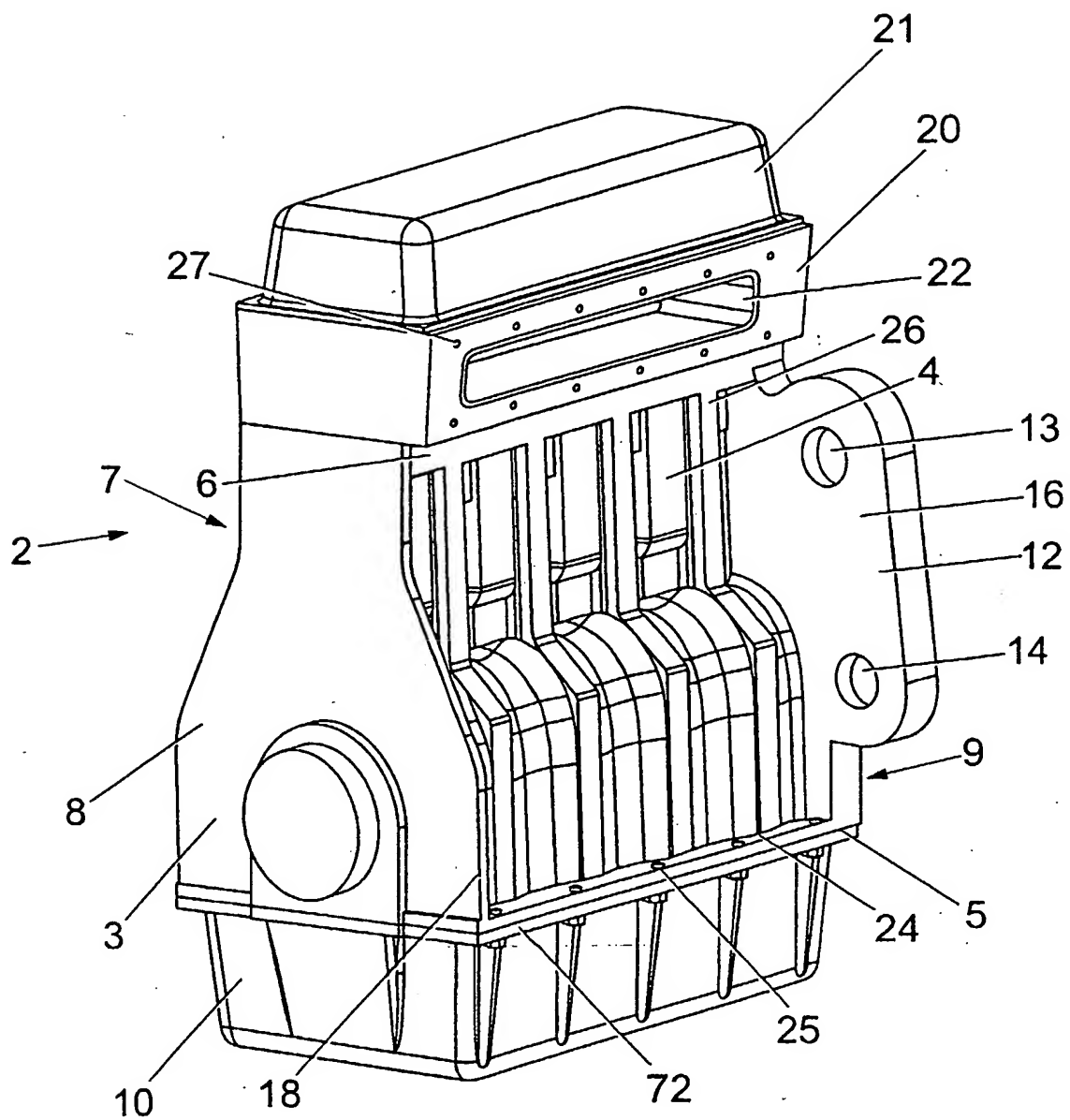


Fig. 2

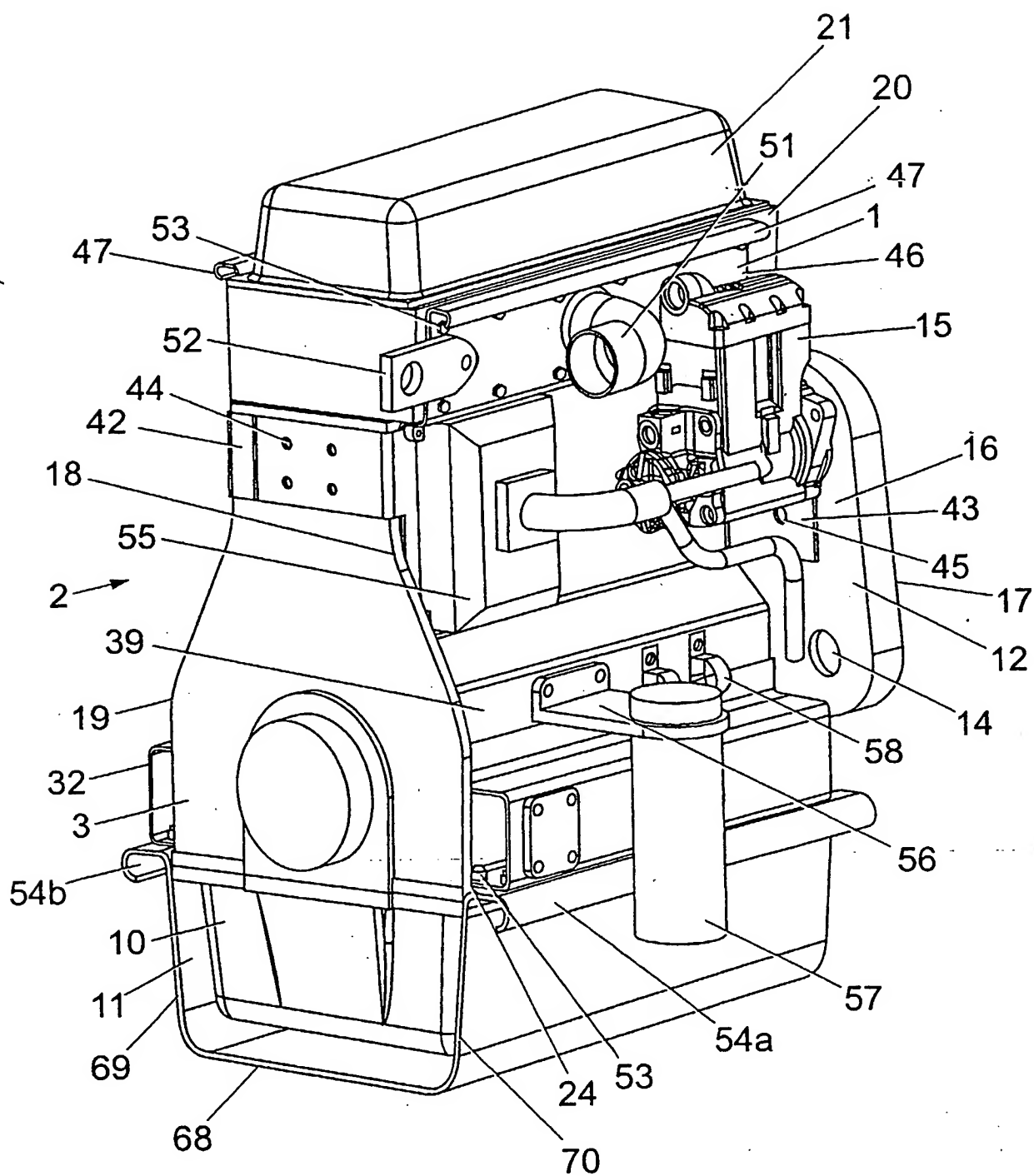


Fig. 3

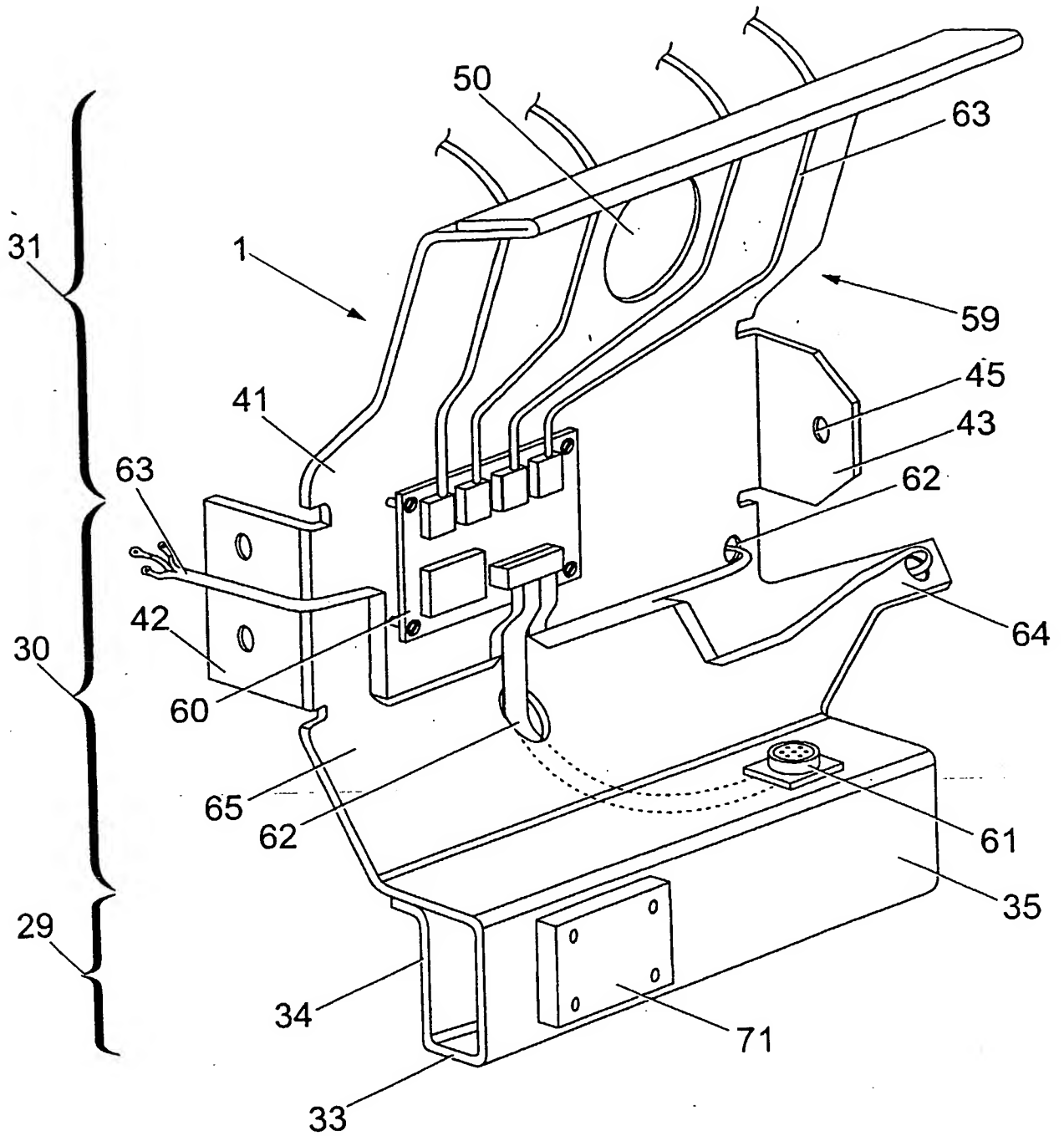


Fig. 4

1 **A CYLINDER BLOCK WITH A COMPONENT MOUNTING APRON**

2

3 Technical Field

4

5 This invention relates to a cylinder block assembly
6 to which engine components may be mounted and to an
7 internal combustion engine including the cylinder
8 block assembly. The invention also relates to a
9 method for fabricating an engine and mounting engine
10 components thereto.

11

12 Background

13

14 Cylinder blocks are in general extremely expensive to
15 fabricate. In particular, where a cylinder block
16 must be customised for particular applications e.g.
17 to receive engine accessories, costs increase
18 greatly. Moreover, the degree to which cylinder
19 blocks can be customised is in general limited.

20

1 Known cylinder blocks are not easily configurable
2 externally to suit different vehicle or static
3 installations during high or low volume production
4 which can compromise optimum manufacturing
5 flexibility. However, in engines which are of
6 generally similar construction but are to be
7 installed in differing installations, for example,
8 road vehicles or static installations such as
9 generating sets, the cylinder blocks may require
10 specific external configurations to accommodate
11 engine mounting points and transmission housings
12 dedicated to the intended installation. The
13 aforementioned problem may be particularly acute
14 where the cylinder block is manufactured in volumes
15 of less than 50,000 per annum.

16
17 Where customisation is possible, it is in general
18 necessary to machine the cylinder block on at least
19 one of a side, front or rear wall, thereby giving
20 rise to significant additional costs.

21
22 UK Patent specification No 2342391 describes an
23 engine having a rear end flange having apertures for
24 mounting ancillary units. Adapter plates are
25 provided to facilitate customisation of the engine,
26 each plate being machined to co-operate with a given
27 aperture and dimensioned to facilitate mounting of a
28 given size of ancillary unit. Use of the adapter
29 plate obviates the need to machine the flange.
30 Further, different adapted plates may be used to fit
31 and mount different size pumps on the same aperture.

1 As both faces of each adapter plate are machined or
2 dimensioned for a specific task, the flexibility of
3 use if a given plate is extremely limited. Moreover,
4 each plate is designed to mount only a single
5 ancillary unit. The present invention sets out to
6 overcome one or more of the disadvantages of the
7 prior art.

8

9 Summary of the invention

10

11 According to the invention there is provided a
12 cylinder block assembly for an engine comprising a
13 cylinder block having a sidewall provided with apron
14 attachment points, and an apron mountable on said
15 sidewall, the apron being adapted to receive engine
16 components, wherein the apron is a tray-like cover.
17 There is also provided an engine including such a
18 cylinder block assembly.

19

20 According to the invention there is also provided a
21 method of fabricating an engine including a cylinder
22 block comprising the steps of providing apron
23 attachment points on a sidewall of the cylinder
24 block, selecting and attaching an apron to the
25 sidewall of the cylinder block and mounting at least
26 one engine component on the apron, wherein the apron
27 is a tray-like cover.

28

29 There is also provided a method of fabricating a
30 plurality of customised engines, each of said

1 customised engines having a different arrangement of
2 engine components, comprising the steps of:

3
4 selecting a common cylinder block for said
5 customised engines, providing apron attachment points
6 on a sidewall of the common cylinder block, selecting
7 a customised apron corresponding to the customised
8 engine to be fabricated, attaching said customised
9 apron to the sidewall of the cylinder block and
10 mounting at least one engine component corresponding
11 to the customised engine to be fabricated on said
12 customised apron.

13
14 The invention also seeks to provide an apron for
15 mounting to a sidewall of a cylinder block of an
16 engine, wherein the apron is a tray-like cover
17 adapted to receive engine components.

18
19 Brief Description of the Drawings

20
21 Various embodiments of the invention will now be
22 described, by way of example only, having regard to
23 the accompanying diagrammatic drawings in which:

24
25 Figure 1 is an isometric view of a cylinder
26 block apron in accordance with the invention;

27
28 Figure 2 is an isometric view of an engine
29 including a cylinder block adapted to receive the
30 apron of Figure 1;

1 Figure 3 is an isometric view of the apron of
2 Figure 1 mounted on the cylinder block of Figure 2
3 with an optional sump guard attached to the apron;
4 and

5 Figure 4 is an isometric view of a further
6 embodiment of the apron of the invention in which the
7 apron is provided with electrical harness elements
8 and an electronic control unit.

9
10 Detailed Description

11
12 As shown in the drawings, a cylinder block apron 1 in
13 accordance with the invention is a generally tray-
14 like cover mountable on and co-operable with a
15 cylinder block 2 which is adapted to receive the
16 apron 1 in a mating relationship. The apron 1 is
17 dimensioned to substantially conform with a sidewall
18 6,7 of the cylinder block 2. The apron 1 facilitates
19 configurational flexibility of the cylinder block 2
20 to provide a low cost attachment method for engine
21 subsystem components without requiring machining of a
22 sidewall 6 of the cylinder block 2.

23
24 As shown in Figure 2, in the present embodiment of
25 the invention, the cylinder block 2 is a
26 substantially conventional cylinder block 2.
27 However, the apron 1 may be adapted for use with
28 various cylinder block types without departing from
29 the scope of the invention.
30 The cylinder block 2 is made up of a cylinder block
31 core 3, a cylinder block outer body 4 and a cylinder

1 block base 5. The cylinder block 2 includes a
2 cylinder block first side wall 6, a cylinder block
3 second side wall 7 substantially parallel with the
4 cylinder block first side wall 6, a cylinder block
5 front end wall 8 and a cylinder block rear end wall 9
6 all upstanding from the cylinder block base 5. In
7 the present example, the first side wall 6 is
8 substantially non-machined, i.e. free of tapped
9 bosses, machined faces, extended structures and other
10 features normally required to secure ancillary engine
11 components to the cylinder block 2.

12
13 A sump 10 is attached to the cylinder block base 5.
14 Optionally, the sump 10 is of a composite
15 construction and may be provided with a sump guard 11
16 customised for attachment to the apron 1. The sump
17 guard provides a base for the engine during engine
18 storage and transport, thus precluding damage that
19 could be inflicted upon a sump made from a composite
20 or other lightweight material. The sump guard 11 is
21 made up of a metal sheet or other suitable material
22 and is configured to have an open-ended U-shape,
23 though the sump guard may, if required, be provided
24 with end walls. The sump guard 11 therefore has a
25 bottom wall 68, a first side wall 69 and a second
26 sidewall 70 upstanding from the bottom wall 68. The
27 first side wall 69 and the second side wall 70 are
28 provided with sump guard rails 54a,b at their free
29 ends for securing the sump guard 11 to the apron 1 at
30 side wall 6 and to a second apron 1 or other

1 attachment such as a bracket (not shown) at side wall
2 7.

3

4 The cylinder block rear end wall 9 is provided with a
5 bearing plate 12 which projects laterally outwards
6 from the first side wall 6. The bearing plate 12 has
7 an inner face 16 disposed towards the sidewall 6.

8 The bearing plate 12 is provided with an upper bore
9 13 and a lower bore 14 to receive engine ancillary
10 components. For example, as shown in Figure 3, a
11 fuel pump 15 is mounted in the upper bore 13 on the
12 inner face 16.

13

14 The front end wall 8 projects laterally outwardly
15 from the first side walls 6 to define a flange 18.

16

17 The cylinder block 2 is provided with a cylinder head
18 20 fitted with a cylinder head cover 21. The
19 cylinder head 20 is provided with an integral air
20 inlet manifold 22.

21

22 The cylinder block 2 and the cylinder head 20 are
23 provided with attachment points 25, 26, 27 for
24 facilitating attachment of the structural apron 1 to
25 the cylinder block 2 and the cylinder head 20. In a
26 preferred embodiment, the attachment points are made
27 up of a combination of mechanical (25, 27) and
28 adhesive (26) attachment points. However, any
29 structurally sound construction for attaching the
30 apron 1 to the cylinder block 2 and cylinder head 20
31 is suitable and within the scope of the invention.

1 For example, the attachment points may be exclusively
2 mechanical or exclusively adhesive, or combined with
3 other suitable forms of attachment point.

4

5 The cylinder block 2 has a bottom flange 24 at the
6 cylinder block base 5 along the first side wall 6.
7 Flange 24 is provided with flange holes 25 for
8 receiving fasteners to mechanically secure the apron
9 1 to the cylinder block 2.

10

11 The cylinder block 2 is also provided with adhesive
12 receiving ribs 26 formed on the first side walls 6 of
13 the cylinder block 2 for receiving adhesive to
14 adhesively secure the apron 1 to the cylinder block
15 2. The ribs 26 extend vertically upwards from the
16 cylinder block base 5.

17

18 Preferably, the cylinder head 20 has threaded holes
19 27 surrounding the inlet manifold 22. The threaded
20 holes 27 are adapted to receive fasteners to
21 mechanically secure the apron 1 to the cylinder head
22 20.

23

24 As indicated above, the apron 1 is substantially
25 tray-like in shape. The apron 1 is formed from a
26 sheet metal or other suitable material shaped or
27 configured so that the apron 1 is adapted to mate
28 with the sidewall 6 of cylinder block 2. The apron 1
29 is dimensioned to substantially conform with the
30 dimensions of the cylinder block 2. However, it is
31 intended that the apron of the invention may in

1 certain instances be dimensioned to cover an
2 externally mounted balance shaft. For example, the
3 apron 1 is dimensioned to fit between the bearing
4 plate 12 and the flange 18 and between the cylinder
5 block base 5 and cylinder head 20 at the sidewall 6.
6 As shown particularly in Figure 1, the apron 1 is
7 made up of a bottom portion 29, a central cylinder
8 block portion 30 and a top cylinder head portion 31.

9
10 The bottom portion 29 of the apron 1 is folded to
11 define an elongate beam 32 having a box-like cross
12 section. The box-like elongate beam 32 is therefore
13 made up of a beam bottom wall 33 having elongate
14 first and second beam side walls 34, 35 respectively
15 upstanding therefrom. The box-like beam 32 is
16 further provided with a beam top wall 36 extending
17 between the first and second side walls 34, 35
18 respectively.

19
20 The beam bottom wall 33 is provided with a first and
21 second series of spaced apart beam attachment holes
22 37, 38 respectively. The first series of attachment
23 holes 37 is located on the beam bottom wall 33 to
24 complement the flange holes 25 on the cylinder block
25 2. The second series of attachment holes 38 is
26 adapted to receive sump guard fasteners to secure the
27 optional sump guard 11 to the apron 1.

28
29 The elongate beam 32 provides additional and
30 efficient stiffness to an assembled engine structure
31 while the box-like construction of the beam 32 serves

1 as a chassis rail and provides stiffened engine
2 mounting locations. The elongate beam 32 is hollow
3 and open at at least one end, so that the tines (not
4 shown) of a fork lift truck or other lifting
5 apparatus may be inserted in the beams 32 provided on
6 each side of the engine structure to facilitate
7 lifting of the engine structure.

8
9 The central cylinder block portion 30 is contiguous
10 with the tray bottom portion 29 and is shaped and
11 folded to facilitate mating of the apron 1 with the
12 cylinder block first sidewall 6.

13
14 The central cylinder block portion 30 of the apron 1
15 is made up of an upstanding panel 39 which is a
16 continuation of the second beam side wall 35, a
17 transverse panel 40 and a upstanding primary panel 41
18 adapted to abut the ribs 26 on the cylinder block 2.
19 The upstanding panel 39, the transverse panel 40 and
20 the primary panel 41 are separated by fold lines
21 about which the apron 1 is folded as previously
22 described.

23
24 The primary panel 41 is provided with a front
25 mounting panel 42 which extends inwardly from the
26 primary panel 41 in a plane disposed perpendicular to
27 a plane defined by the primary panel 41 and oriented
28 to mate with the front end wall 8 of the cylinder
29 block 2. Front mounting panel 42 is provided with
30 front mounting panel through holes 44 adapted to
31 receive fasteners for securing the front mounting

1 panel 42, and hence the apron 1, to the cylinder
2 block 2. The rear mounting panel 43 extends
3 outwardly from the primary panel 41 in a plane
4 disposed perpendicular to the plane of the primary
5 panel 41 and in an orthogonal direction away from
6 side wall 6. The rear mounting panel 43 is also
7 provided with a through hole 45 for receiving a
8 fastener for securing the rear mounting panel 43 to
9 the bearing plate inner face 16.

10

11 In an alternative embodiment, the front mounting
12 panel 42 and the rear mounting panel 43 can be
13 extended in length if required to join or meet with
14 an apron 1 located on an opposite side wall 7 of the
15 cylinder block 2 to provide additional attachment
16 areas for engine auxiliary components, e.g. fan
17 mountings and the like.

18

19 The apron cylinder head portion 31 is made up of an
20 upright cylinder head panel 46 contiguous with the
21 primary panel 41. The cylinder head panel 46, like
22 the primary panel 41, is disposed in a substantially
23 upright disposition and is shaped at its free end to
24 define an elongate top rail 47. The top rail 47
25 projects outwardly away from the cylinder head 20.

26

27 The top rail 47 provides additional stiffness to an
28 assembled engine structure while in an alternative
29 embodiment also serving to attach the apron 1 to the
30 cylinder head 20 where the apron 1 and the cylinder
31 head 20 are provided with suitable attachment points.

1 In a still further embodiment the top rail 47 can
2 also be adapted to be fastened to the cylinder head
3 cover 21 if required.

4

5 The cylinder head panel 46 has a top series of spaced
6 apart mounting holes 48 located adjacent the top rail
7 47 and a bottom series of spaced apart mounting holes
8 49. The top series of mounting holes 48 and the
9 bottom series of mounting holes 49 are adapted to
10 receive fasteners for securing the cylinder head
11 panel 46 to the cylinder head 20.

12

13 The cylinder head panel 46 has an aperture 50 to
14 facilitate communication between an elbow connector
15 51 engageable with the aperture 50 and the air inlet
16 manifold 22 within the cylinder head 20.

17

18 Figure 3 shows the cylinder block 2 fitted with the
19 apron 1 of Figure 1. Figure 3 shows the cylinder
20 head panel 46 further provided with a lifting eye 52
21 to facilitate lifting of a cylinder block 2 to which
22 the apron 1 is attached. The apron 1 is mounted on
23 the cylinder block first side wall 6. However, it
24 will be appreciated that an apron 1 can be mounted on
25 any one or more of the first side wall 6 and the
26 second side wall 7.

27

28 The apron 1 is fastened to the side wall 6 by
29 fasteners 53 inserted through holes (not shown) in
30 flange 72 of the sump 10, through corresponding holes

1 25 in the flange 24 of the cylinder block 2 and into
2 threaded holes 37 in the beam bottom wall 33.

3

4 The cylinder head panel 46 of the apron 1 is secured
5 to the cylinder head 20 by fasteners 73 inserted
6 through the mounting holes 48, 49 of the cylinder
7 head panel 46 into the corresponding threaded holes
8 27 in the cylinder head 20.

9

10 As previously described, the ribs 26 on the cylinder
11 block 2 can also be secured to the primary panel 41
12 of the apron 1 by an adhesive such as a flexible non-
13 setting adhesive which could be applied by a robot
14 applicator or screen printing of the adhesive on to
15 the apron 1. A non-setting adhesive facilitates
16 creep of the apron 1 on the cylinder block 2 while
17 also serving to damp engine vibrations.

18

19 The optional sump guard 11 is secured to the apron 1
20 by inserting fasteners 53 through holes in the sump
21 guard rail 54 into corresponding threaded holes 38 on
22 the beam bottom wall 33.

23

24 The fasteners 53 can be any suitable fasteners such
25 as threaded screws or studs and nuts. Threaded holes
26 37, 38 can be formed by any conventional means such
27 as weld nuts, rivet nuts, edge clips and the like.
28 Alternatively, threaded holes 37, 38 can be formed by
29 the "Flowform" (Trade Mark) process in which a hole
30 is pierced in apron 1 and thread-rolled.
31 Alternatively, the fasteners 53 may be weld studs,

1 self-tapping screws, rivets or the like, in which
2 case the holes 37, 38 will not need to be pre-
3 threaded.

4
5 Attachment of the sump guard 11 to the apron 1
6 increases the stiffness of an assembled engine
7 structure. Accordingly, due to the increased
8 stiffness, traditional stressed cast iron sumps used
9 in frameless tractor applications can be dispensed
10 with while a lighter weight construction for the sump
11 (e.g. plastics mouldings) can be employed due to the
12 increased stiffness provided by the apron to the sump
13 guard.

14
15 The apron 1 is secured to the front end wall 8 of the
16 cylinder block 2 at the front mounting panel 42 by
17 fasteners and to the bearing plate inner face 16 at
18 the rear mounting panel 43 by fasteners.

19
20 Engine mountings and engine component mountings can
21 be formed and located on the apron 1 as required in
22 accordance with a desired installation by welding
23 suitable mountings to the apron. For example the
24 apron 1 can be provided with an array of individual
25 tapped cylindrical bosses (not shown) welded to the
26 elongate beam 32, separate formed brackets (not
27 shown) designed to suit installation mounting
28 locations and welded to the apron 1 at distributed
29 and reinforced locations and/or one or more thickened
30 plates 71, each with an array of tapped holes, welded
31 to the elongate beam 32 (see Figure 4).

1 Ancillary engine components and accessories can
2 therefore be mounted to the apron 1 instead of the
3 cylinder block 2 thereby obviating machining of at
4 least one wall (side wall 6 in the present example).
5 For example, as shown in Figure 3, an electronic
6 control unit (ECU) 55 is mounted on the primary panel
7 41. The apron 1 is adapted to receive engine
8 components by any suitable fastening means.

9
10 The upstanding panel 39 of the central cylinder block
11 portion 30 of the apron 1 has an oil filter mounting
12 bracket 56 for supporting an oil filter 57. The
13 upstanding panel 39 is also provided with cable clips
14 58 for supporting cables on the apron 1.

15
16 An elbow connector 51 is also connected to the
17 cylinder head panel 46 for facilitating communication
18 to the air inlet manifold 22. In an alternative
19 embodiment of the invention extended and low strength
20 manifolds, such as plastics manifolds used in
21 automobiles, can be supported by the apron 1.

22
23 As previously described, the fuel pump 15 is mounted
24 in the upper bore 13 on the inner face 16. The fuel
25 pump 15 is not mounted directly on the apron 1 but is
26 nevertheless supported by the apron 1 at a bracket
27 (not shown).

28
29 Figure 4 shows an isometric view of a second
30 embodiment of an apron 1 of the invention. The apron
31 of Figure 4 is broadly similar to the apron described

1 in Figure 1 above. Accordingly, like numerals
2 indicate like parts. However, in the present
3 embodiment, the apron 1 is adapted to support
4 electrical harness elements 59 on an external face 65
5 of the sheet metal material of the apron 1. The
6 apron 1 therefore serves as an extended circuit board
7 for the electrical harness elements 59.

8
9 The electrical harness elements 59 are made up of an
10 electronic circuit board 60 mounted on the face 65 of
11 the apron 1 and ribbon cables 63 extending from the
12 electronic circuit board 60 to various engine parts
13 (not shown). The electrical harness elements 59 are
14 also made up of a machine interface connector 61 also
15 mounted on the face 65 of the apron 1.

16
17 The face 65 may be an internal face, in which case
18 the apron 1 serves to protect the electrical harness
19 elements 59 located between the apron 1 and the
20 cylinder block 2 when the apron 1 is mounted on the
21 cylinder block 2.

22
23 The apron 1 is further provided with ribbon cable
24 openings 62 in the apron 1 to facilitate
25 communication of the ribbon cables 63 between the
26 electronic circuit board 60 and the engine
27 components.

28
29 In the present embodiment of the invention, the apron
30 1 is provided with a third mounting panel 64 for
31 securing the apron 1 to the cylinder block 2 in

1 accordance with the shape of the cylinder block 2 for
2 which the apron 1 of Figure 4 is configured.

3

4 As indicated above the apron 1 of the invention can
5 be employed with a cylinder block 2 having a
6 conventional cylinder head 20.

7

8 However, in an alternative embodiment of the
9 invention, it is envisaged that the cylinder head 20
10 can be made up of a cylinder head 20 having side
11 walls terminating at a top peripheral flange.
12 attachable to a cylinder head cover 21. In a still
13 further embodiment of the invention, the face of the
14 cylinder head 20 on which the inlet manifold 22 is
15 located, together with the cylinder head panel 46 of
16 the apron 1, can be angled outwards to facilitate
17 vertical removal of the cylinder head 2 without
18 disturbing the apron 1. Accordingly, following
19 removal of the fasteners 53 from the cylinder head
20 panel 46 of the apron 1, the cylinder head 20 can be
21 easily removed from the apron 1 to facilitate lifting
22 of the cylinder head 20 from the cylinder block 2.

23

24 In the given example, apron 1 is envisaged as having
25 a thickness of from about 2 to about 4 millimetres
26 but thickness selection will need to take into
27 account variables such as the required stiffness,
28 ease of forming and the duty to which the apron is to
29 be subjected to, as well as the accessories to be
30 mounted thereon and whether engine mountings and
31 transmission housings are to be attached thereto.

1 The apron 1 may be reinforced locally as required.

2 The apron can be flat folded and bent or pressed to
3 shape as required.

4

5 The apron 1 is preferably formed from high strength
6 low alloy (HSLA) steel but can also be formed from
7 cold rolled mild steel, aluminium sheet or any other
8 material having suitable characteristics. The apron
9 1 can be configured by laser machining or the like or
10 may be numerically controlled punch profiled. The
11 apron 1 may be folded by a brake press and deep drawn
12 for pressed features.

13

14 Typically, the apron 1 is fabricated as a single
15 formed sheet. Alternatively, the apron can be formed
16 by welding or otherwise joining one or more panel
17 parts to form a single integral apron. Further, the
18 apron or its constituent parts may be configured as
19 tailored blanks comprising panel parts of different
20 thickness or different metallurgy. For example, the
21 central portion 30 and top portion 31 could be formed
22 from a mild steel for carrying light accessories
23 whilst the bottom portion 29 could be formed from an
24 alloy steel for carrying engine or transmission
25 mounting points.

26

27 The apron 1 can also serve to provide an alternative
28 to a separate cover plate for an oil cooler element
29 where such element is fully or partly recessed within
30 the side wall 6 of the cylinder block 2. In this
31 embodiment of the invention, the apron 1 could be

1 reinforced e.g. by welding an additional flange to
2 match a profile of the cooler opening to achieve an
3 adequate seal/joint to meet cooling jacket
4 temperatures/pressures.

5
6 In a further embodiment of the invention, the apron 1
7 can provide additional outer cover and/or attachment
8 means for an externally mounted balance shaft thus
9 providing a noise barrier to noise emanating from the
10 balance shaft.

11
12 The apron 1 preferably, and in general, extends over
13 the whole of an engine side, including the cylinder
14 head 20 and the cylinder block 2. Accordingly, the
15 apron 1 may be provided with a colour scheme as
16 required thereby dispensing with or reducing the
17 requirement to paint engine cylinder blocks and the
18 like following manufacture. An advantage of
19 employing a colour is that the paint finish quality
20 may be easily controlled e.g. with epoxy paints.
21 Moreover, pre-painted aprons can also be employed
22 with cylinder blocks 2 while aprons 1 formed from
23 sheet steel can be readily plated for show or special
24 finishes e.g. infra-red absorption, zinc, chromium,
25 gold and the like. Moreover, anodised aluminium
26 finishes can also be employed.

27
28 The apron 1 also serves to provide a surface for
29 printing corporate identification, end user
30 identification and other user instructions on an
31 engine employing screen-printing techniques and the

1 like. Alternatively, the apron 1 serves to provide a
2 good bonding surface for application of adhesive
3 labels and the like to an engine.

4

5 Industrial Applicability

6

7 The apron 1 of the invention results in lower
8 manufacturing costs for cylinder blocks 2 and in
9 particular for cylinder blocks 2 requiring
10 customisation as side wall machining of the cylinder
11 blocks 2 to receive engine auxiliary components is
12 reduced or eliminated. Moreover, the apron 1 of the
13 invention results in lower noise and vibration in
14 engines fitted with the apron 1. The apron 1
15 therefore facilitates enhanced flexibility in
16 cylinder block design and manufacture.

17

18 Examples of such engine accessories and auxiliary
19 components include, but are not limited to: engine
20 electronic control units and wiring harnesses, clips
21 and ties; low pressure fuel system components such as
22 lift pumps, filters, pipes; high pressure fuel
23 systems including fuel injection pump support
24 brackets; lubrication system components including
25 remote filter mountings, electric oil pumps, hose
26 attachments and closed circuit breather system
27 components; cooling system components including
28 electrical cooling pumps, mechanical cooling pumps,
29 hose attachments, heat exchangers for oil and EGR
30 systems and fan mountings; ancillary drives including
31 brackets and attachments for alternators, PAS pumps,

1 vacuum pumps, compressors, air conditioning pumps,
2 idler pulleys, tensioners and other driven
3 accessories; air system components including air
4 ducts and trunking, inlet manifolds and elbows, inlet
5 air heat exchangers, exhaust mountings, TC oil drain
6 supports and the like; emissions system components
7 including mountings for closed coupled after-
8 treatment devices and EGR components; engine mounting
9 parts; transmission mounting parts.

10

11 The apron 1 can be employed with substantially
12 conventional cylinder blocks 2 having at least one
13 sidewall 6, 7 provided with suitable attachment
14 points for the apron 1.

15

16 The apron 1 facilitates the reduction or elimination
17 of tapped bosses and machined faces on at least one
18 sidewall of the cylinder block 2. The cylinder block
19 2 can therefore be designed for minimal machining
20 operations while extended structures normally needed
21 to attach engine auxiliary components can also be
22 dispensed with. The apron 1 can be employed with
23 short block, deep skirt or ladder constructions of
24 cylinder block while the cylinder block can be
25 formed, in conventional manner, from cast iron or
26 aluminium. The apron 1 can also facilitate engine
27 transport and handling. For example, the elongate
28 beam 32 may be adapted for engagement with forklift
29 truck tines while the lifting eye 52, where present,
30 can facilitate lifting of an engine.

31

1 As indicated above, the apron 1 can be attached to
2 the cylinder block 2 employing low cost sheet metal
3 fastening methods such as the Flowform (Trade Mark)
4 process, weld nuts and studs, rivet nuts, self-
5 tapping screws, rivets, edge clips and the like. The
6 same fastening methods may be used to mount engine
7 components and accessories on the apron 1.

8
9 In an alternative embodiment of the invention, the
10 apron 1 can be provided with tapped metal strips for
11 arrays of fasteners e.g. for attachment of the sump
12 guard rail 54.

13
14 The apron 1 can be pre-assembled with some engine
15 auxiliary components in order to further increase
16 engine manufacture efficiency. Such components
17 include electronic control units, harnesses, pipes,
18 brackets etc., which can be pre-assembled with the
19 apron 1 as a sub-assembly on a side feeder to a main
20 assembly line. It will be appreciated by those
21 skilled in the art that shorter main assembly lines
22 serve to reduce work in progress and provide greater
23 flexibility and reduced costs.

24
25 The apron 1 mounted on a cylinder block 2 with
26 fasteners 53 and adhesive facilitates damping and
27 lessens acoustic energy at an engine surface to
28 reduce radiated noise. Moreover, the apron 1
29 provides additional structural stiffness to increase
30 natural bending/torsion frequencies and thereby

1 reduce transmitted noise and vibration to permit
2 optimal mounting designs.

3

4 The apron 1 provides application design flexibility
5 and facilitates customisation of an engine. For
6 example, aprons 1 manufactured on adaptable
7 numerically controlled laser profilers, punches and
8 brake presses may be easily customised to customise
9 the cylinder block 2. Such equipment could be
10 located close to an assembly line to provide late
11 specification flexible manufacture of cylinder blocks
12 while the ease with which additional brackets and
13 other fabricated parts may be welded or otherwise
14 joined to the apron 1 provides a means for satisfying
15 customer specific requirements without excessive
16 tooling costs or disruption to base engine
17 production. In effect, engine mountings and other
18 apparatus may be located at a desired location on the
19 apron 1 as required without significant additional
20 costs. A common cylinder block 2 can thus be used
21 with a number of customised aprons 1 to manufacture a
22 number of customised engines, each different
23 customised engine having a different arrangement of
24 engine components mounted on the corresponding
25 customised apron 1.

26

27 The invention is not limited to the embodiments
28 herein described which can be varied in construction
29 and detail.

1 CLAIMS

2

3 1. A cylinder block assembly for an engine
4 comprising:

5 a cylinder block having a sidewall provided with
6 apron attachment points, and

7 an apron mountable on the sidewall, the apron
8 being adapted to receive engine components, wherein
9 the apron is a tray-like cover.

10

11 2. A cylinder block assembly for an engine
12 comprising:

13 a cylinder block having a sidewall provided with
14 apron attachment points, and

15 an apron mountable on the sidewall, the apron
16 being adapted to receive engine components, wherein
17 the apron is dimensioned to substantially conform
18 with the sidewall of the cylinder block.

19

20 3. A cylinder block assembly as claimed in Claim 1
21 or 2 wherein the sidewall is substantially non-
22 machined.

23

24 4. A cylinder block assembly as claimed in any
25 preceding Claim wherein the attachment points include
26 adhesive attachment points.

27

28 5. A cylinder block assembly as claimed in Claim 4
29 wherein the adhesive attachment points include
30 adhesive receiving ribs formed on the cylinder block.

31

1 6. A cylinder block assembly as claimed in any of
2 Claims 1 to 5 wherein the apron includes an elongate
3 beam adapted for engagement with a tine of a lifting
4 apparatus.

5
6 7. A cylinder block assembly as claimed in any
7 preceding Claim further including at least one engine
8 component mounted on the apron.

9
10 8. An engine comprising a cylinder block assembly
11 as claimed in any of Claims 1 to 7.

12
13 9. A method of fabricating an engine including a
14 cylinder block comprising the steps of:

15 providing apron attachment points on a sidewall
16 of the cylinder block;

17 selecting and attaching an apron in the form of
18 a tray-like cover to the sidewall of the cylinder
19 block; and

20 mounting at least one engine component on the
21 apron.

22
23 10. A method as claimed in Claim 9, wherein the
24 apron is dimensioned to substantially conform with
25 the sidewall of the cylinder block.

26
27 11. A method of fabricating a plurality of
28 customised engines, each of said customised engines
29 having a different arrangement of engine components,
30 comprising the steps of:

31

1 selecting a common cylinder block for said
2 customised engines, providing apron attachment points
3 on a sidewall of the common cylinder block, selecting
4 a customised apron corresponding to the customised
5 engine to be fabricated, attaching said customised
6 apron to the sidewall of the cylinder block and
7 mounting at least one engine component corresponding
8 to the customised engine to be fabricated on said
9 customised apron.

10

11 12. A method as claimed in Claim 11, wherein the
12 apron is a tray-like cover which is dimensioned to
13 substantially conform with the side of the cylinder
14 block.

15

16 13. A method as claimed in Claim 11 or 12, wherein a
17 plurality of engine components are mounted on the
18 customised apron, the engine components being
19 selected from the group comprising:

20

21 engine electronic control units and wiring
22 harnesses, clips and ties; low pressure fuel system
23 components such as lift pumps, filters, pipes; high
24 pressure fuel systems including fuel injection pump
25 support brackets; lubrication system components
26 including remote filter mountings, electric oil
27 pumps, hose attachments and closed circuit breather
28 system components; cooling system components
29 including electrical cooling pumps, mechanical
30 cooling pumps, hose attachments, heat exchangers for
31 oil and EGR systems and fan mountings; ancillary

1 drives including brackets and attachments for
2 alternators, PAS pumps, vacuum pumps, compressors,
3 air conditioning pumps, idler pulleys, tensioners and
4 other driven accessories; air system components
5 including air ducts and trunking, inlet manifolds and
6 elbows, inlet air heat exchangers, exhaust mountings,
7 TC oil drain supports and the like; emissions system
8 components including mountings for closed coupled
9 after-treatment devices and EGR components; engine
10 mounting parts; transmission mounting parts.

11

12 14. An apron for mounting to a sidewall of a
13 cylinder block of an engine, the apron comprising a
14 tray-like cover adapted to receive engine components.

15

16 15. An apron as claimed in Claim 14, wherein the
17 apron is dimensioned to substantially conform with
18 the sidewall of the cylinder block.

19

20 16. A cylinder block assembly substantially as
21 hereinbefore described with reference to the
22 drawings.

23

24 17. An apron substantially as hereinbefore described
25 with reference to the drawings.



INVESTOR IN PEOPLE

Application No: GB 0206298.2
Claims searched: 1 to 17

Examiner: John Twin
Date of search: 13 August 2002

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): F1B (B5Q2, B5Q3C, B5Q3D)

Int Cl (Ed.7): F02B 67/00; F02F 7/00

Other: online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WO 2002/04802 A1 (MTU Friedrichshafen)	
A	US 4697782 (Toyota)	

X Document indicating lack of novelty or inventive step
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